REMARKS

The above-referenced Office Action has been carefully reviewed and reconsideration thereof is respectfully requested.

Two typographical errors in the CROSS-REFERENCE TO RELATED APPLICATIONS have been corrected. The information on the Filing Receipt is correct.

Obvious typographical errors at page s 14 and 31 have been corrected.

Claim 12 has been amended to insert an omitted word. Support for this amendment is found, for example, in the paragraph bridging pages 11 and 12.

Support for new Claim 30 is found, for example, from the paragraph bridging pages 9 and 10.

The Examiner has objected to the drawing figures under 37 CFR (p)(5) because they do not show certain reference signs mentioned in the description. It is believed that the above amendments to the drawing figures and to the Specification fully overcome this ground of objection. Note that the occurrences of the number 384 on pages18-20 refer to the number of wells that can be serviced by pipettor 316 or the number of needles the pipettor has. To make this more clear, language has been added to line 21 on page 18. This would be obvious to anyone having ordinary skill in the art.

The drawing figures have been objected to under 37 CFR (p)(4), since the reference character "436" has been used in the description of two different elements. An obvious typographical error has been corrected to overcome this ground of objection.

Claims 15 and 16 have been rejected under 35 USC 112, second paragraph, as being indefinite. It is believed that the above amendment to those claims fully overcomes this ground of rejection.

Claims 1-3, 10, 15, and 21-23 have been rejected under 35 USC 102(b) as being anticipated by Guigan. Applicant respectfully traverses this ground of rejection.

First, with respect to Claim 1, element 3 of the reference is not thermally formed, that is, by thermoforming. Element 3 is formed by heat sealing. The description of element 18 says nothing about thermoforming. These are two entirely different operations and are well known to those having ordinary skill in the art.

With respect to Claim 2, Figures 3 and 18 do not show a liquid-tight seal. In fact, the description of Figure 1 states that openings 4 are left for access to the capsules and it must be assumed that similar openings are provided in other embodiments.

With respect to Claim 3, it is obvious that the carrier tape could not be formed into a compact roll because of the protruding reliefs.

With respect to Claim 10, it is not seen that the sealing material is ever removed, a limitation of Claim 10.

With respect to Claim 15, the holes of Guigan are sprocket drive holes and are not for evacuating anything. Applicant's Claim 15 has been reworded to make this clear.

With respect to Claims 21-23, the above comments with respect to Claims 1-3 are applicable and are incorporated here.

Claims 1, 18, and 21 have been rejected under 35 USC 102(b) as being anticipated by Tsunekawa et al. Applicant respectfully traverses this ground of rejection.

With respect to Claims 1 and 21, what the Examiner claims are thermally formed chemical receiving wells 1a are, in fact, holes that serve as reflection density measuring openings. They are most likely formed in a stamping operation.

With respect to Claim 18, to the extent that claim does not contain limitations not shown by the reference, that claim contains limitations that when taken with the limitations of the claim from which it depends are not shown by the reference.

Claims 4-8 and 16-18 have been rejected under 35 USC 103(a) as being unpatentable over Guigan in view of Anderson. Applicant respectfully traverses this ground of rejection and incorporates here the above remarks with respect to Guigan.

The Examiner has applied this ground or rejection to Claims 16-18, but has not explained how the references are applied to those claims.

With respect to the other claims, please see the General Comments below.

Claims 9 and 11-14 have been rejected under 35 USC 103(a) as being unpatentable over Guigan in view of Hansen et al. Applicant respectfully traverses this ground of rejection and incorporates here the above remarks with respect to Guigan.

The Examiner has applied this ground of rejection to Claim 14, but has not indicated how it is applied to that claim.

With respect to the other claims, please see the General Comments below.

GENERAL COMMENTS

The Examiner states that " a change in size is generally recognized as being within the level of ordinary skill in the art" and cites In re Rose, 105 USPQ 237 (CCPA 1955). In re Rose involved a relatively small change in size of bundled lumber and the CCPA stated in that case that the size of an article under consideration is not ordinarily a matter of invention. 105 USPQ 237, 240 (emphasis added). In this application, size is one defining element over the prior art.

In the referenced patents, the size of the receiving wells is in the order of 1cc and larger (Guigan) and 1 to 3cc (Anderson) and generally this size is referenced in the other patents. At 1cc (1mL) (1000 microliters), these wells are a two orders of magnitude, larger than the wells in the present application (10 microliters.) This change in well size cascades the complexity of the problem in many areas. These are discussed below.

The 8 x 12 matrix on 9mm centers (96 well) is the defacto industry standard, as are its sub-divisions of 16 x 24 on 4.5mm spacing (384 well) or 32 x 48 on 2.25mm spacing (1536 well). It is an entirely different problem creating a well to hold 10 microliters or less when located at 4.5mm on center compared to a 1 to 3cc well spaced on a belt. This is particularly true if thermoforming is to be the method of manufacture. The surface area of the well must be drawn from what is the circular area of the wells top opening. This circular area is limited since enough land area between wells must be reserved as a sealing surface. That is the reasoning behind Claim 4 specifying 15 mils to

about 20 mils. A thinner web surface will not provide sufficient thickness at the bottom of the well. The material specified in the referenced patents is on the order of 1 to 2mils.

Thermoforming of many materials is common, particularly in the packaging industry. However, the use of Thermoforming to create wells with a brim volume of 10 microliters on 4.5mm center to center matrix is new and novel.

Several referenced patents teach sealing either by heat sealing or pressure sensitive adhesives. Again, this is common practice if there is adequate land area around the perimeter of the well. That is not the case with the well size and spacing of this invention. It is a compromise of providing enough material to draw the well surface area from and still leave sufficient land area around the well perimeter to effect a leak proof seal.

The referenced patents teach sealing each well independently. This is accomplished by bringing two halves together (Guigan) or sealing a packet to a carrier (Anderson). None of the referenced patents teach sealing a pattern of wells simultaneously, as does this invention. As the referenced patents indicate obtaining a leak proof seal around the perimeter of the well is an essential problem to be overcome.

Not in claims

The economics of manufacturing dictates sealing the complete pattern with a continuous sheet of sealing material. When overlaying the seal material to the carrier tape, containing the wells, there will be a layer of air that may become entrapped. Any entrapped air between the mating sealing surface will prevent a leak proof seal from being obtained around the perimeter of each individual well. The contents of each well in the pattern must be individually sealed so as not to contaminate the adjacent wells. Not only must a liquid tight seal be obtained for the application but also an airtight seal. A small pinhole air leak will allow the microliter contents of the well to evaporate.

This invention overcomes this entrapped air problem by a series of small holes in the carrier tape. Applying vacuum to the bottom side of the seal area evacuates the entrapped air, assuring that the sealing surfaces are in intimate contact, effecting a positive seal around each well.

It is one thing to seal the wells; however the application intended for this invention requires access to the well contents after sealing. The primary access required

is to all wells simultaneously. This invention teaches the use of a specific sealing material that can not only effect a heat seal but can also be peeled at the time of access, providing full access to all wells.

Other means of access are not acceptable. The silted opening (Astle) for access would not provide the airtight seal required to eliminate evaporation of the 5 microliter volume of the well contents. The limited depth of the well prohibits puncturing the seal for access. It could not be assured that the puncturing probes would not touch the contents of the shallow well. This would require some method of cleaning to prevent cross contamination of the next pattern of wells. This is the basis for the sealing material specified in Claim 2.

On some applications, a pressure sensitive seal as specified in Claim 9 can be used. The same problem of entrapped air between the sealing surfaces applies. Claim 15 specifies the use of small holes as shown in Figure 1, element 70. The term "small holes" is intended to relate to the scale of Figure 1, compared to the size of the wells in element 30. The well size is not dimensioned but is specified as being on 4.5mm centers, which implies its size.

While pressure sensitive adhesives can be used on some applications, for the primary market of the invention, heat sealing is the preferred method. The thermoplastic sealing material has proven to be inert for the long-term storage of chemical compounds' solvated in DiMethyl Sulfoxide (DMSO). The same history of use does not exist for pressure sensitive adhesives in the presence of DMSO. DMSO is an excellent solvent and that is why it is so widely used.

The use of heat sealing is the preferred method. As stated above, an effective positive seal must be obtained around each individual well. Manufacturing economically dictates sealing the entire pattern simultaneously. To achieve this seal, a two layer sealing film is specified in Claim 11 along with the reasoning for it. However, obtaining the initial seal is only part of the problem for this application. It must also lend itself to peeling for open access.

To achieve this, Claim 14 of this patent application teaches the use of a heated roll to warm the seal area at the point of peeling. The higher tensile strength of the polyester

top seal layer provides the separating force at the seal since it is connected to a rewind spool applying tensile force.

It is agreed that the use of sprocket holes to facilitate what is described as a tractor drive is not new or novel. It probably originated with motion picture film, but currently can be found in many applications. In this invention, as in some of the cited patents, the sprocket drive holes permit precise indexing and location of a specific area on the tape. Since the specific area is to be used for a specific purpose, each specific area must be identified. The referenced patents indicate various ways this may be accomplished.

However, none of the referenced patents teach indexing repetitive patterns of wells. They teach singular elements that may be repeated. In this invention there are basically two repetitive patterns. The sprocket drive holes are on 6mm spacing, which is an industry standard. The well pattern is 24 rows of wells on 4.5mm spacing, which is another industry standard. The primary objective of the sprocket drive is to be able to precisely index the specific element to a known position by counting steps or sprocket holes. This means there must be a fixed number of sprocket holes between each repetitive pattern. Thus, row # 1 of the well pattern will always be a fixed number of sprocket holes apart. This whole number of sprocket holes must be evenly divided by 6mm and 4.5mm. In this invention the number is 144mm. This is a requirement for this application that is not addressed by the referenced patents. Using a common numerator that when divided by two different denominators produces a common whole number permits individual identification of each pattern by the simple expedient of counting holes (i.e. stepper motor steps.) That unique identifier may be assigned and recalled a number of ways as indicated in Claim 8.

During handling of a full roll of sealed wells, there is no assurance that the contained liquid volume will be at the bottom of the well for access. This again is related to the size problem. Surface tension alone can overcome the force of gravity when a small liquid volume is placed in a well with a larger surface area than that of the liquid volume. The result is that the small drop of liquid may be adhered to the bottom of the seal surface or the sidewall of the well and not the bottom of the well for access.

This invention, in Claim 17, claims spinning the entire sealed roll of samples utilizing centrifugal force to overcome surface tension forces to place the contents of the

wells at the bottom for access. This is not implied nor taught in any of the referenced patents.

As in the referenced patents, Claim 18 indicates that individual patterns may be cut from the continuous carrier tape and used individually. If patterns are cut individually, the method of unsealing defined in Claim 14 may be of limited use if not done automatically in a continuous mode. Therefore Claim 16 defines a method of die cutting though the seal layer, but not into the carrier tape itself. Testing has shown this facilitates manually removing of the seal material, when an individual pattern of wells is used regularly. This technique allows the individual carrier tape pattern to be clamped in a support frame. Since the seal area for access has been perimeter cut, it allows the seal to be removed. The skeleton of the seal area remains clamped with the carrier tape itself, by the holding frame.

) Not disclosed

In summary set forth below are some of the differences between this invention and the referenced patents:

1. The smaller size and close spacing of the well presents several technical problems not addressed by the referenced patents.
    a. The need of a 15 - 20mil carrier tape from which to thermoform the wells and still have sufficient thickness in the bottom of the well.
    b. Special sealing methods to remove entrapped air between the mating seal surfaces.
2. A special seal material, as defined, to provide a valid seal around the perimeter of each well and provide sufficient tensile strength for peeling the seal open.
3. Sealing multiple wells simultaneously as opposed to individually sealing each well.
4. Teaches a means of unsealing the wells by warming the seal area combined with a high tensile seal material.
5. Teaches a means of forcing the liquid to the bottom of the well for access.
6. Teaches the use of repetitive patterns with different indexes and their combination to maintain a unique identifier for each pattern of wells.

In view of the above amendments and remarks, it is believed that the claims in the application, Claims 1-18. 21-23, and 30, are allowable and early action in that regard is respectfully requested.

Should any questions remain as to the allowability of the claims or should the Examiner have any suggestions with respect thereto, the undersigned would be grateful for the privilege of a telephone conference with the Examiner.

Date: October 12, 2000.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited today with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231.

John H. Crozier

Date 10/12/00 Regis. No. 30,371